

INTERTEMPORAL REASONING AND CROSS-CULTURAL DECISION MAKING

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ABSTRACT

Elements of economic theory are examined to understand the Euro-American cultural assumptions encoded in their formulation. The research develops a framework by which to understand how Euro-American beliefs relevant to economic theory might be understood or misunderstood in other cultures, with the goal of facilitating inter-cultural dialog. The framework is constructed using an approach based on decomposing key economic concepts into their component elements and relating those elements to research that has identified important cultural views that influence how these components are matched or mismatched by cultural beliefs. We take as our starting point the notion of Net Present Value and the Time Value of Money demonstrating how this single, but central, concept from investment analysis encodes cultural assumptions regarding the linearity of time, equity, individual property and wealth creation. The results are applied to non-western cultural beliefs, particularly in Arabic cultures.

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INTRODUCTION

As western nations engage other cultures with the intent of establishing productive relationships they bring concepts, theories and methods to aid or support those cultures in improving their economic infrastructure. These methods are rooted in western economic theory and its derivatives, including risk assessment, decision analysis, multi-attribute utility, and game theory to name but a few. They extend as well to modern finance and banking, including credit and insurance.

In this paper we introduce an approach to understanding cross-cultural decision making through the lens of western economic theory. Economic science has developed powerful techniques for modeling and aiding important social decisions. For example, techniques derived from economic theory, such as the capital asset pricing model, have proven useful for evaluating (and making decisions about) capital improvement projects at both a national and a local level. Our approach is to identify key economic concepts and principles. These are decomposed into their social, cultural and psychological components and are then evaluated in light of research from a number of disciplines, including cross-cultural psychology, cultural anthropology and comparative religion.

The guiding framework for the evaluation is based on two concepts. One is *cultural congruence*, defined here as the compatibility between the underlying concepts or rationality associated with a theory or method and the cultural context within which the method is applied (e.g., Resnicow, et. al., 2000). A lack of congruence is revealed when social and cultural precepts are contradictory to the underlying rationality of western economics.

A second concept is that of *intertemporal* reasoning. We use the rubric of intertemporality to refer to psychological, social and cultural processes that are engaged when people are called upon to either integrate past experiences or project forward to future (and unrealized or imagined) experiences as a basis for indicating a preference, desire or likelihood in the present (Trope and Liberman, 2003; Forster, Friedman and Liberman, 2004). For example, the concept of risk in economics and finance theory is based on intertemporal reasoning processes that summarize and project past experiences into potential consequences for the future. Likewise, the process of reconstructing a cultural history for the purposes of evaluating the appropriateness, desirability, and/or risk of a present action calls upon intertemporal reasoning processes that involve the accumulation and integration of historical events or decisions to arrive at a reference point for current actions. Our working hypothesis is that research in cultural anthropology, psychology and economics can be used to inform and guide the appropriate use and development of methods of formal analysis in the context of non-western cultures. This hypothesis leads us to a methodology that involves examining the concepts underlying western economic methods in light of their cultural congruence and how intertemporal reasoning is influenced by cultural factors.

METHODOLOGICAL APPROACH

The methodological approach is based on the fundamental precept that methods of analysis based on western economics require for their inputs a set of *thought experiments*. These can take the form of direct assessments or questions (e.g., probability or desirability of a future event) or they involve implicit judgments (e.g., social or cultural acceptability of a financial prospect such as insurance). Acceptance of the output of the analysis is predicated upon acceptance of the validity of

the thought experiments, and the validity of the logic applied to the results of the thought experiments (e.g., MacGregor and Slovic, 1986). Key to these thought experiments are notions about time and the relationship between time and preferences, and the effects of intertemporal reasoning on cognitive processes (Trope and Liberman, 2003; Forster, Friedman and Liberman, 2004). Thus, to apply these methods requires a pre-existing set of cultural factors (e.g., beliefs, tenets) that are consistent with what is required from those on whose behalf the method is applied.

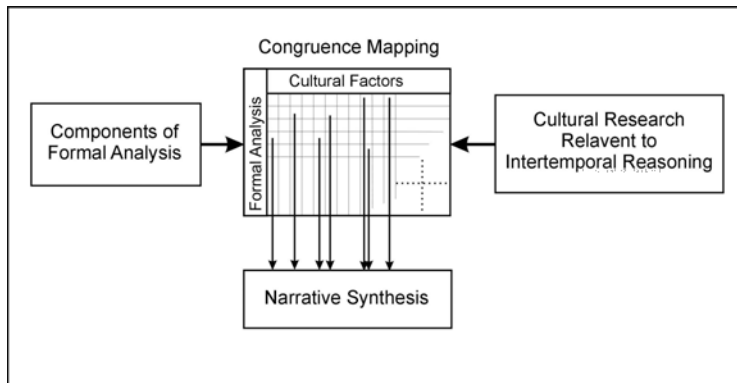


FIGURE 1.1 Congruence mapping approach.

To improve our understanding of western economic principles applied in non-western cultures, we develop a framework for mapping the relationship between cultural perspectives and the elements of economic theory. To explore the connections between practically linked but disciplinarily distinct areas (such as economic theory and cultural anthropology) we require a methodology based on the techniques of *grounded theory* to induce relationships from theories and data obtained from a range of domains (Strauss and Corbin, 1994). Essentially, grounded theory advocates the development of formal knowledge and theories from the substantive analysis of interconnections, essentially developing theory from theory (Glaser and Strauss, 1967). Grounded theory is operationalized here by developing a mapping between economic principles in terms of a collection of theories and applied techniques, and cultural knowledge. The mapping can be conceptualized as a two-dimensional matrix, the rows of which represent component elements of economic theory, and the columns of which represent culture-based logic (Figure 1).

The cells of the matrix represent points of connectivity that reflect either cultural congruence, contradiction, or some amalgam of the two. The mapping provides a platform for the development of a narrative interpretation. We illustrate the basics of our approach with a brief analysis of the concept of Net Present Value (NPV) that is central to western economics and finance. We first decompose NPV into its component elements and then discuss these elements in terms of concepts drawn from the general literature on Arabic culture, including the principles of Islam.

THE CONCEPT OF NET PRESENT VALUE (NPV) IN WESTERN AND NON-WESTERN CULTURES

HISTORY OF NET PRESENT VALUE

The modern notion of NPV is based on the time value of money (TVM) and dates from Fibonacci's *Liber Abaci* in 1202 (Goetzmann, 2003). In this work Fibonacci introduced discounting the future value of cash flows to arrive at their *present value*. Hindu mathematicians anticipated Fibonacci by nearly 700 years. As early as 500 CE the Hindu mathematician Āryabhata solved interest rate problems, but did not develop the concept of present value. Fibonacci built directly on the work of the Arabic mathematician Al Khwārizmī, but with a different focus. Whereas Al Khwārizmī, focused on dividing inheritance among family members, Fibonacci focused on dividing capital among merchants. The concern for mercantile applications and public finance appear to be distinguishing characteristics of uses in the West of TVM in contrast to the East, notably China and India. (Goetzmann and Rouwenhorst, 2005)

DECOMPOSITION OF NET PRESENT VALUE

Assuming a fixed rate of interest, the net present value of a stream of cash flows is represented by the general formula

$$P = \sum_{k=0}^N \frac{F_k}{(1+i)^k},$$

where the index, k , represents an interval of time. During these intervals the interest rate, i , is constant, but the cash flow, F_k , is allowed to vary per interval. The present value of all these cash flows is given by the sum and denoted as P . Each component in the formula embodies assumptions with cultural significance. We enumerate each component and then subsequently discuss their potential cultural implications.

TIME INTERVAL

The most fundamental requirement for TVM is linear time. It must be possible to identify regular intervals of time and that these proceed in a successive manner, i.e., a linear, monotonic sequence. That this is a non-trivial requirement can be seen in cultures that redistribute property on a cyclic basis, e.g., the Year of Jubilee. The progressive view of time, especially one that envisions a future of ever increasing wealth, is a strong but common assumption of western economics. Critiques of this assumption from within the western economic framework (e.g., Malthus) illustrate this point. Even those sympathetic to Malthus, may regard this concern as a "horizon problem," and continue to rely on linear, progressive time for routine economic/financial calculation.

CASH FLOW

The concept of cash flow involves several social constructs. First and most obvious is a *medium of exchange*, an intermediary instrument that enables exchanges of goods without direct barter. In

order for exchange to be meaningful and possible, the goods must have a recognized value mediated by the medium of exchange. For an instrument to serve as a medium of exchange certain properties are necessary: it must carry and retain value, it must be recognizable, transportable, divisible, and difficult to counterfeit (Gwartney and Stroup, 1997). Money, however, is rarely of value in and of itself. Paper money, for example, carries and retains value, but only in its capacity to mediate exchanges and has no intrinsic value. Gold, by contrast, can serve as money but also as store of value, i.e., as something valued in itself. Our principal concern is with money that is not a store of value.

For a medium of exchange to function, social constructs are required, notably property rights (Grossman, 2002). It must be possible for two parties to separately own goods that are exchanged via intermediate transactions involving money. Ownership consists in the ability and the power, to determine the disposition of a good – its creation, destruction, modification, or exchange for other goods. The enforcement of this power, in turn, requires sufficient social organization to recognize and respect property rights on a routine basis. And finally, the social organization must be sufficiently stable that goods can be exchanged over and extended time period, so that one may consider the possible variation of value between goods in the period between which the exchange of these goods is realized, in order for the time value of money to be relevant. Thus, we require a stable social system with a mechanism to enforce basic property rights, in the sense that agents can and do benefit from commerce in goods they own.

INTEREST

A fundamental problem in a mediated exchange of goods is the possibility that value of the goods changes between the time when the exchange is agreed to and completed. Fibonacci addressed this problem by introducing the notion of *present value* by which sums of money at different points in time are incommensurable. To compare the value of a good in the present with another good in the future, one must transform the future value into a present value. The transformation is accomplished by removing (or adding) to the future value its change in value from the present, ΔP , to wit

$$F = P + \Delta P.$$

The change in P can be expressed by some multiplicative factor, r , the “effective interest rate” for the period in question, so that

$$F = (1 + r) P.$$

If there is a defined interval, the effective interest rate can be expressed using an interest rate per interval, i , such that

$$F = (1 + i)^N P.$$

For r much smaller than 1, $r \ll 1$, $i \approx r/N$.

The important question for this paper is how interest arises. In western cultures, interest arises from a number of sources. For example, a sufficient condition for commerce is that two parties to an

exchange value the goods received in the exchange. This can be achieved when each party is “better” at producing his or her product than the other party – so that each benefits more from the exchange than from producing the goods on their own. In short, there is a division of labor. This division of labor gives rise to interest rates, as a form of rent. Interest rates in western economies represent the general demand for capital. According to this picture the interest rate in effect measures the degree of and demand for innovation (division of labor) in a market.

Interest rates can also be based on uncertainties associated with the future value of a good due to a variety of factors, including incomplete knowledge about the future and future conditions that would affect the good. In this sense, interest can be seen a reflection of risk in transactions involving future exchanges. This presents a challenge to non-western cultures when interest is derived from either speculative activities (*maysir*) or when the future value of a good is subject to factors beyond human control.

COMPARATIVE SYNTHESIS OF ARABIC CULTURAL FACTORS AND NET PRESENT VALUE

For the sake of this paper, our comparative synthesis of Arabic cultural factors associated with NPV is based on Islamic principles that relate to economic and financial transactions. A strict prohibition in Islamic cultures is placed on *ribā*, the “predetermined interest collected by a lender that the lender receives over and above the principles amount it has lent out” (Schoon, 2007 pg. 27).³ Thus, Islamic principles present a challenge to the notion that money can have a time-variant value.

The underlying concern in Islam derives from a strong cultural adherence to social justice as prescribed in the Qur’ān (e.g., Schuon, 1998; Sells, 1999). This expresses itself as a cultural concern that no party to a transaction be disadvantaged by the transaction. In a fair barter exchange, for example, both parties receive goods of comparable value. Each party benefits from the exchange. Likewise, in the loaning of money, the creditor is expected to share in the risks faced by the debtor. For the creditor to profit in the form of interest, without exposure to any of the debtor’s risk, is both unjust and constitutes *gharar*. Essentially, *gharar* is the uncertainty associated with transactions and may come in several forms, including uncertainty about the receipt of payment, social worth of the transaction and ignorance on the part of the debtor with respect to the properties of the transactions (e.g., El-Gamal, 2001). Within the concept of *gharar* complex prohibitions exist that require careful consideration before risk-bearing transactions can be undertaken in a manner consistent with the principles of Islam. Violation of these principles constitutes “trading in risk.” Islam has no difficulty charging rent for the use of commodities, provided these rents do not exploit the renter. As rents are permitted under Islam, a non-Islamic economist may find the prohibition on *ribā* puzzling. Isn’t money just a commodity and so available for rent? Ahmad and Hassan (2006) argue that Islam rejects the view of money as a commodity. Money is regarded strictly as a medium

³ It should be noted that Christianity prior to the 16th century had similar prohibitions.

of exchange, lacking any inherent value. Money can be neither hoarded nor wasted. It must be used to realize its value and is not a culturally-acceptable store of value in itself.⁴

As a short hand, *ribā* forbids the exchange of money for money – where the only difference is time. In this respect the Islamic theory matches views such as those of William of Auxerre (ca. 1220) who asserted that the “the usurer acts contrary to natural law, for he ‘sells time, which is common to all creatures’” (Goetzmann and Rouwenhorst, 2005, p.5). Within the time value of money we can view the interest rate as a clock: within each period (i.e., clock tick) interest compounds. Indeed, under continuous compounding the expression for compounding $(1+i)^N$ becomes e^{it} . In this form the interest rate is manifestly conjugate to time, having units of inverse time.⁵

Within Islamic cultures the difficulties associated with time come in part from the relatively imprecise manner in which intertemporal reckoning occurs, some of which may be reflected in and attributable to the Arabic language itself (e.g., Patai, 2007). The tendency within Arab cultures to conceptualize history in terms of broad stages or periods rather than discrete events (as is in the case in western cultures) is antithetical to the precise and highly-resolved sense of time characteristic of western society. In this sense, we can regard western economics and finance as having commodified time by identifying its properties and value, thereby rendering it suitable for trade. Indeed, it would not be an excessive extrapolation to regard trading in time as trading in risk.

Despite its reservation concerning trading in time, Islam is not inimical to the notion of present value. Indeed Islamic finance recognizes that an asset’s value can change over time and so the comparison of the value of assets over time requires a comparison in terms of present value. Present value, however, is computed using a discount rate, and this does present significant conceptual and theoretical challenges for Islamic finance. As a practical matter, these do not appear to be insurmountable as evidenced by the evolution of Islamic banking along the lines of culturally-acceptable Qur’anic principles. However, Muslims, concerned to avoid *ribā*, have not deposited their wealth in banks for investment, preferring to maintain their wealth in assets that are true and culturally-acceptable stores of value such as precious metals, stones, and the like (Kula 2008). From a western economic perspective this suggests that Islamic cultures have significantly underutilized their capital, thereby foregoing significantly higher standards of living. A similar thesis has been propounded by Hernando de Soto (2000), where he argues that in failing to secure property rights (a key assumption of TVM) for their peoples, non-western countries have similarly forgone opportunities for creating wealth. This brings into sharp focus the challenges faced by non-western economies to realize their potential for commerce and wealth creation.

⁴ Specifically Ahmand and Hassan (2006) argue that money has no intrinsic utility, being unable to fulfill any human need directly. It lacks any other qualities except its role as a medium of exchange. Other commodities are posited as multifaceted. And finally money is not to be localized in a transaction. Money should facilitate a transaction, but should not be essential to a transaction.

⁵ That time is not a commodity one can buy and sell was a common understanding between Islam and medieval Christianity. Western Christianity, however, began to abandon its prohibitions on usury in the 16 century, when Henry VIII of England relaxed the prohibitions on usury with his “Acte Agaynst Usurie” (Makower, 1972; pg. 454).

CONCLUSIONS

This paper has presented a framework for examining cross-cultural rationalities. The framework, based on cultural congruence and intertemporal reasoning, was applied to a concept central to western economics and finance, that of Net Present Value (NPV). The decomposition of NPV revealed that embedded in its logic are assumptions about intertemporal reasoning and culture-bound conceptualizations of the time value of money. Using this decomposition as lens through which to view Arab culture, we find that non-western views about time interact with views about the culturally-appropriate ways to define and accumulate wealth. These views differ sharply from those in the west in that they place strong emphasis on social justice, set in place cultural prohibitions against certain types of financial transactions, and reflect culturally-defined views about risk that may carry over into a variety of decisions that include, but are not necessarily limited to, those involving economics and finance.

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REFERENCES

- Ahmad, A. U. F. and Hassan, M. K. (2006). The time value concept of money in Islamic finance. *American Journal Of Islamic Social Sciences*, 23(1), 66-89.
- Ahmad, A. U. F., and Hassan, M. K. (2007). Riba and Islamic banking. *Journal of Islamic Economics, Banking and Finance*, 3(1), 1-33.
- De Soto, H. (2000). *The Mystery of Capital (2000)*. New York: Basic Books.
- El-Gamal, M. A. (2001). *An economic explication of the prohibition of gharar in classical Islamic jurisprudence*. Paper presented at the 4th International Conference on Islamic Economics, Leicester, UK, 13-15 August 2000. (Available at <http://www.ruf.rice.edu/~elgamal/files/gharar.pdf>).
- El-Gamal, M. A. (2003). Interest and the paradox of contemporary Islamic law and finance, *Fordham International Law Journal*, 27(1), 108-149.
- Forster, J., Friedman, R. S., and Liberman, N. (2004). Temporal construal effects on abstract and concrete thinking: Consequences for insight and creative cognition. *Journal of Personality and Social Psychology*, 87 (2), 177-189.
- Glaser, B.G., and Strauss, A.L. (1967). *The discovery of grounded theory: Strategies for qualitative research*. New York: Aldine.
- Goetzmann, W. N., (2003). *Fibonacci and the Financial Revolution*. Yale ICF Working Paper No. 03-28. Available at SSRN: <http://ssrn.com/abstract=461740>.
- Goetzmann, W. N. and Rouwenhorst, G. (2005). *The origins of value*. New York: Oxford University Press.
- Grossman, H. I. (2002), Make us a king: Anarchy, predation, and the state. *European Journal of Political Economy*, 18(1), 31-46.

- Gwartney, J. D. and Stroup, R. D. (1997). *Economics*. Orlando, FL: The Dryden Press.
- Kula, E. (2008). Is contemporary interest rate in conflict with Islamic ethics? *KYKLOS*, 61(1), 45–64.
- Lichtenstein, S., and Slovic, P. (2006). *The construction of preference*. New York: Cambridge University Press.
- MacGregor, D., and Slovic, P. (1986). Perceived acceptability of risk analysis as a decision-making approach. *Risk Analysis*, 6, 245-256.
- Makower, F. (1972). *The Constitutional History and Constitution of the Church of England*. New York: Burk Franklin.
- Resnicow, K., Soler R., Braithwaite R., Ahluwalia J., and Butler J. (2000). Cultural sensitivity in substance use prevention. *Journal of Community Psychology*, 28, 271-290.
- Strauss, A., and Corbin, J. (1994). Grounded theory methodology: An overview. In N. K. Denzin & Y. S. Lincoln (eds.), *Handbook of qualitative research* (pgs. 273-285). Thousand Oaks, CA: Sage.
- Trope, Y., and Liberman, N. (2003). Temporal construal. *Psychological Review*, 110 (3), 403-421.
- Schoon, N. (2007). Islamic finance: risk management challenges and the impact of Basel II. *Global Association of Risk Professionals*, 37, 27-37.
- Schuon, F. (1998). *Understanding Islam*. Bloomington, IN: World Wisdom.
- Sells, M. A. (1999). *Approaching the Qur'án*. Ashland, OR: White Cloud Press.

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